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# Four new rust taxa on *Asteraceae* from Central Alborz, northern Iran

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Abstract — During the study of the rust mycobiota of Central Alborz, four new taxa (two species and two varieties) were found: *Puccinia artemisiae-chamaemelifoliae* on *Artemisia chamaemelifolia*, *P. crepidis-asadbarensis* on *Crepis asadbarensis*, *P. jaceae* var. *elbursensis* on *Centaurea behen*, and *P. punctiformis* var. *karajensis* on *Cirsium arvense*.

Key Words — *Fungi*, *Pucciniales*, taxonomy, mycology

## Introduction

The Central Alborz, located in the middle Alborz chain, is situated at 35°00′–36°30′N 50°20′–53°10′E and contains several peaks above 3000 m (Gitasshenasi 2004). Due to its varied topography and climate, this area has a remarkable diversity of vegetation (Klein 1994). The rust mycobiota of Central Alborz has not yet been intensively studied. The *Asteraceae* harbor a wide range of rust fungi, especially species of the genus *Puccinia*. In Iran, so far 66 *Puccinia* spp. have been reported on hosts of 44 asteraceous genera. During the course of studies on the rust mycobiota of Central Alborz, several *Puccinia* spp. on asteraceous plants have been identified. Four of them proved to be new and are described in this paper.

## Materials & methods

Several rust-infected plant specimens were collected from different parts of the Central Alborz region in northern Iran. All specimens were studied macroscopically and microscopically. Color, shape and structure of sori of all infected specimens were carefully examined by an Olympus stereomicroscope. Glycerine-Lactic acid was used in preparing microscopic slides. All preparations were studied by an Olympus BH2 Nomarski Differential Interference Contrast Microscope (DIC) at magnifications of × 400 and × 1000. 50 spores per specimen were randomly selected and measured. All

specimens are deposited in the Fungal Reference Collection of the Ministry of Jihad-e Agriculture (IRAN) located at Iranian Research Institute of Plant Protection, Tehran.

## Taxonomy

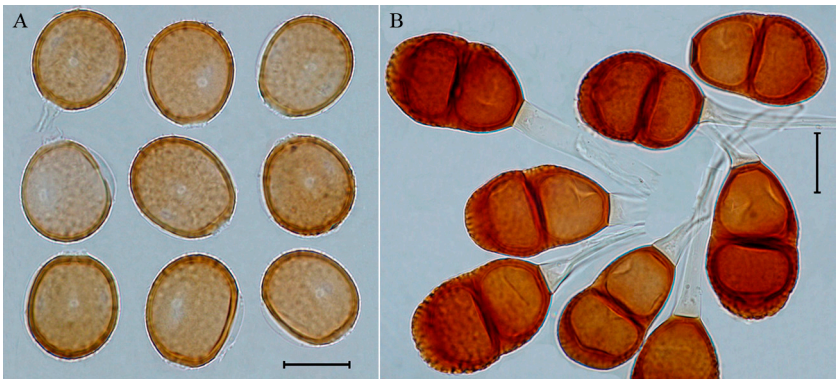


Plate 1. ***Puccinia artemisiae-chamaemelifoliae*** on *Artemisia chamaemelifolia:* A. urediniospores; B. teliospores. Scale bars = 20 µm.

***Puccinia artemisiae-chamaemelifoliae*** Aliabadi & M. Abbasi, **sp. nov.** Plate 1

Mycobank MB 564231

Differs from *Puccinia absinthii* s. lat. by its smaller teliospores with a smaller length/width ratio.

Type: On *Artemisia chamaemelifolia* Vill.: Iran, Tehran Prov., Central Alborz, Haraz road, Hareh village, 3 km after village, alt. 2000–2200 m, II+III, 5 August 1993, leg. J.Fatehi, M.Abbasi & Z.Ghanbari (**holotype**, IRAN 14660 F).

Etymology: referring to the host species.

Spermogonia and aecia not observed. Uredinia epiphyllous and caulicolous, yellowish brown, round to oval–oblong, semi-compact; urediniospores 27.5–32.5(–37.5) × (20–)22.5–25(–27.5) µm, globoid to ovoid, wall yellowish brown, 1.5–2.5 µm thick, echinulate, with 3(–4) equatorial germ pores covered with hyaline papillae. Telia mostly epiphyllous and caulicolous, blackish brown, round to oblong, semi–compact; teliospores (37.5–)40–47.5(–50) × (22.5–)25–30 µm, ellipsoid, broadly obovoid, clavate or oblong, wall 2.5–5 µm thick at the sides and sometimes up to 7.5 µm apically, chestnut–brown, finely and densely verrucose, verrucae more visible on the upper cell of the spore and becoming smaller towards the hilum, germ pore of the upper cell approximately apical and of the lower cell below the septum, pedicel hyaline, persistent, up to 90 µm long.

Comments — Based on Braun's revision (Braun 1981), the rust on *A. chamaemelifolia* is close to *P. absinthii* s. lat. but differs from it in having smaller

teliospores and a smaller teliospore length/width ratio. *Puccinia artemisiae-chamaemelifoliae* teliospores have a mean length of 43.5 µm and a mean width of 27.5 µm, giving a mean length/width ratio of 1.6. However the mean teliospore length for *P. absinthii* is greater than 45 µm and its teliospore L/W ratio is 1.7–2.1 (Braun 1981). The only *Puccinia* species reported on *A. chamaemelifolia* is *P. chamaemelifoliae* published by Viennot-Bourgin (1958); according to the original description, only the uredinial state was present, with urediniospores 21–29 × 19–23 µm, i.e., smaller than those of *P. artemisiae-chamaemelifoliae*.

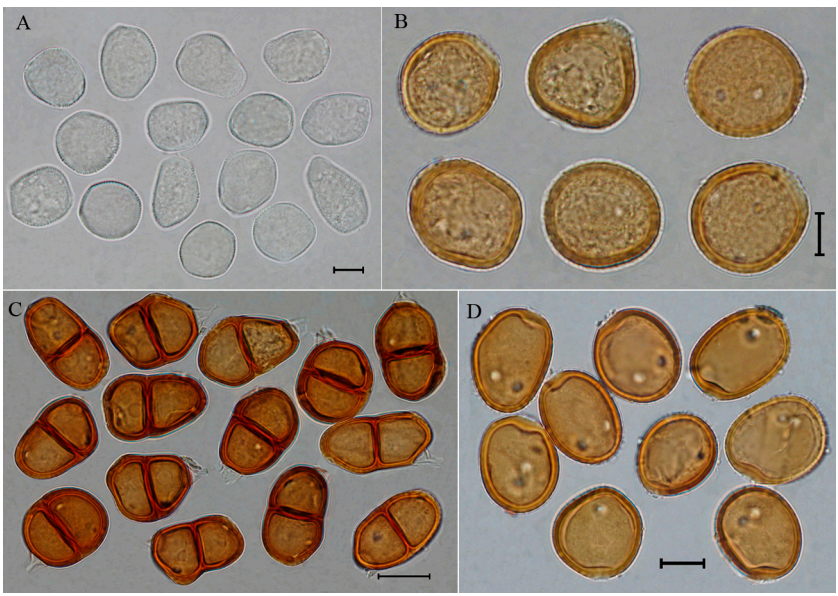


Plate 2. ***Puccinia crepidis-asadbarensis*** on *Crepis asadbarensis:* A. aeciospores; B. urediniospores; C. teliospores. ***Puccinia jaceae*** var. ***elbursensis*** on *Centaurea behen*: D. urediniospores. Scale bars: A–B, D=10 µm, C=20 µm.

***Puccinia crepidis-asadbarensis*** Aliabadi & M. Abbasi, **sp. nov**. Plate 2A–C

Mycobank MB 564233

Differs from *Puccinia crepidis-pygmaeae* by its larger urediniospores and teliospores.

Type: On *Crepis asadbarensis* Bornm. ex Rech.f.: Iran, Tehran Prov., Central Alborz between Shemshak to Dizin, alt. 2800 m, I+II+III, 11 July 1994, leg. M.Abbasi (**holotype**, IRAN 14662 F).

Etymology: referring to the host species.

Spermogonia unknown. Aecia localized, in clusters; aeciospores 17.5–20 (–22.5) × 12.5–17.5 µm, mostly polygonal, wall hyaline, 1-1.5 µm thick, finely verrucose. Uredinia amphigenous, round, pulverulent, brown, rupturing the epidermis; urediniospores (20–)22.5–30(–32.5) × (17.5–)20–25(–27.5) µm,

globoid, ellipsoid or obovoid, wall echinulate, 1.5–2.5 µm thick, somewhat thicker at germ pores, germ pores 2(–3), equatorial. Telia amphigenous, round, pulverulent, black, rupturing the epidermis; teliospores (30–)32.5–40 (–42.5) × 22.5–27.5 µm, broadly ellipsoid or oblong, rounded at both ends, wall finely verrucose, 2.5 µm thick, germ pore of the upper cell apical or subapical, rarely close to the septum, and that of the lower cell close to the septum or equatorial.

Additional specimens examined: On *Crepis asadbarensis*: **IRAN**, **Tehran Prov.**, Central Alborz, Firoozkuh, Gaduk towards Doab, 20 km of Doab, Zagh-Bolagh Mountains, alt. 2300–2600 m, II+III, 30 June 1991, leg. F.Termeh & M.Mousavi (IRAN 14661 F); Shahrestanak, near Gilkola spring, alt. 2500 m, I+II+III, 12 August 1993, leg. M.Abbasi, J.Fatehi & O.Foitzik (IRAN 11174 F).

Comments — On the basis of the identification key published by Braun (1981), *P. crepidis-asadbarensis* is close to *P. crepidis-pygmaeae* but differs in having larger urediniospores (mostly >25 µm in diam.) and teliospores (32–40 µm long). *Puccinia crepidis-pygmaeae* urediniospores are mostly 20–25 µm long and teliospores 24–31 × 19–24 µm (Braun 1981). The host plant, *Crepis asadbarensis,* endemic to the Alborz area, belongs to section *Berinia* (Rechinger et al. 1977); no rust has previously been reported on plant species from this section in Iran.

***Puccinia jaceae* var. *elbursensis*** Aliabadi & M. Abbasi, **var. nov.** Plate 2D

Mycobank MB 564234

Differs from *Puccinia jaceae* var *jaceae* by its urediniospores with larger smooth patches around the germ pores.

Type: On *Centaurea behen* L.: Iran, Tehran Prov., around Karaj, Gholgholak Spring, II+III, 22 May 1998, leg. M.Abbasi (**holotype**, IRAN 14667 F).

Etymology: referring to the mountain range near the type locality.

Spermogonia and aecia not seen. Uredinia amphigenous, round, pulverulent, cinnamon–brown, surrounded by the ruptured epidermis; urediniospores 25–32(–37.5) × 20–27.5 µm, mostly ellipsoid or globoid, wall echinulate, 1.5–2.5 µm thick, yellowish brown, germ pores 2(–3), supraequatorial, with smooth patches around the germ pores, up to 18 µm diam. Telia amphigenous, round, scattered, sometimes with a central sorus surrounded by an encircling group of sori (arranged in concentric circles), pulverulent, blackish brown; teliospores (35–)37.5–45(–52.5) × 22.5–27.5 µm, broadly ellipsoid, wall 2–3 µm thick, slightly thicker at pores, verrucose, sometimes verrucae arranged in more or less evident longitudinal rows, germ pore of the upper cell subapical and that of the lower cell approximately equatorial, germ pores covered by minute, verrucose papillae.

Additional specimens examined — On *Centaurea behen*: **IRAN**, **Tehran Prov.**, 25 km of NE of Tehran, Latian dam, II+III, August 1968, leg. M.Iranshahr (IRAN 14666 F);

Karaj-Chalus road, Kondor village, in an orchard, alt. 1800 m, II+III, 17 June 1997, leg. M.Abbasi et al. (IRAN 14668 F).

Comments — To judge from Braun (1981), *P. jaceae* is delimited from *P. hieracii* by teliospores with a mean width >25 µm and urediniospores with smooth patch <10 µm. This rust species is restricted to *Centaurea* spp. (Braun 1981). Interestingly, all three rust samples on *C. behen* we studied had teliospores with a mean width >25 µm (similar to *P. jaceae*) but urediniospores with smooth patches >10 µm (different from *P. jaceae*), leading us to describe the new variety, *P. jaceae* var. *elbursensis*.

Re-examination of the *P. jaceae* specimen on *Centaurea macrocephala* Puschk. ex Willd. (IRAN 13722 F) reported by Donyadoost-Chalan et al. (2009) showed urediniospores with smooth patches <10 µm, identifying it as *P. jaceae* var. *jaceae* in agreement with Braun (1981).

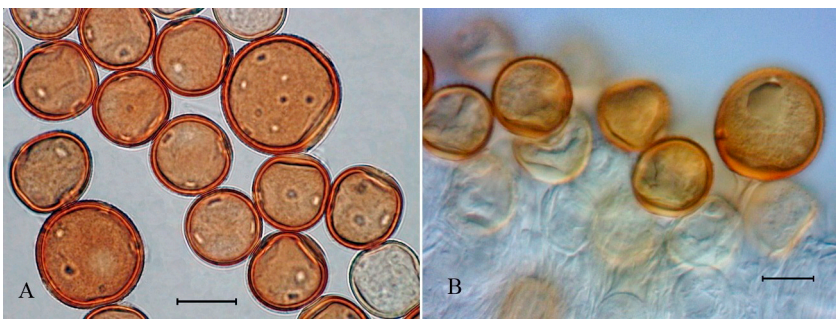


Plate 3. ***Puccinia punctiformis*** var. ***karajensis*** on *Cirsium arvense:* A. urediniospores; B. cross-section of uredinium. Scale bars = 20 µm.

***Puccinia punctiformis*** **var. *karajensis*** Aliabadi & M. Abbasi, **var. nov.** Plate 3

Mycobank MB 564235

Differs from *Puccinia punctiformis* var. *punctiformis* by its dimorphic urediniospores.

Type: On *Cirsium arvense* (L.) Scop.: Iran, Tehran Prov., Karaj-Chalus road, 2 km S of Asara, around the river, alt.1750 m, O+II+III, 30 June 1999, leg. M.Abbasi et al. (**holotype**, IRAN 14659 F).

Etymology: referring to the general type locality.

Spermogonia crowded, amphigenous, in large clusters, honey–colored. Urediniоid aecia mostly hypophyllous and on the stems, systemic, scattered over the whole surface of the leaf, round to oblong, pulverulent, reddish brown; urediniospores of two types, normal urediniospores 23–31 × 23–27 µm, wall echinulate, 1.5–2 µm thick, mostly globoid or broadly ellipsoid, with (2–)3 equatorial germ pores; large urediniospores 33–37(–44) × 32–37(–44) µm, globoid, with 5–8(–10) scattered germ pores. Telia chiefly hypophyllous, rarely epiphyllous and on stems, round to oblong, pulverulent, sometimes covered

by the plant epidermis, black or brownish black; teliospores 34–40 × 21–26 µm, mostly ellipsoid to broadly ellipsoid or obovoid, rounded at both ends or slightly narrowed basally, wall 1.5–2.5 µm thick, chestnut–brown, scattered and finely verrucose, germ pore apical in upper cell, in lower cell close to the pedicel, pedicels short.

Comments — *Puccinia punctiformis* var. *karajensis* differs from *P. punctiformis* var. *punctiformis* in having dimorphic urediniospores with a second type of unusually large spores with 5–8 scattered germ pores. We observed cross-sections of uredinia with larger spores sitting on pedicels surrounded by normal urediniospores. Study of 12 Iranian *P. punctiformis* herbarium specimens from 5 different provinces (IRAN 12389, 9560, 11625, 11776, 4011, 8371, 4010, 6851, 1866, 13752, 15114, 15115 F) and specimens from Turkey (IRAN 6847 F) and Finland (IRAN 4482 F) showed no dimorphic urediniospores.

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